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Underwater Calls of *Leptonychotes* (Weddell Seal)^{1 2}

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(Plate I)

THAT the Antarctic seal *Leptonychotes weddelli* (Lesson) 1826 produces a variety of calls underwater has been known at least since E. A. Wilson's account (1907, pp. 12, 14, and especially 16). He described the calls graphically, recounted hearing the seals calling beneath the ship as well as beneath the ice, and supposed that the calls were communicative. Unfortunately his observations have been missed by later workers, including the senior author (Schevill, Backus & Hersey, 1962, p. 549). More recent observers have seemed reluctant to consider that the calls were made underwater, and presumed that the seals were calling in air trapped under the ice; for example, Lindsey 1937, pp. 139, 143 (though (pers. comm., 1951) he believed that some of the calls were made submerged), and Perkins, 1945, p. 278. Lindsey recorded the in-air calls phonographically in November, 1934; his record was not published, but he has generously supplied copies of it to interested students. In October and November, 1963, underwater recordings were made at McMurdo Sound in the Ross Sea by Dr. Carleton Ray of the New York Zoological Society and Lt. David Lavallee, USN, using a Brush AX 58 C hydrophone and a Uher (Report 4000) tape recorder.

Since a seal calling with its head out of water is audible to an immersed hydrophone, in-air calls are also on the tapes. Some of these barks or howls have fundamental frequencies between 50 and 400 cps with strong harmonic structure, and last from 1/4 to 1 second.

The underwater sounds are impulsive. Sometimes they are made at such long intervals that they might almost be called solitary, but characteristically they occur in series, some of which lasted as long as 42 seconds. These series begin with high frequencies (between 1 and 10 kcps, but usually 1 or 2 kcps) and a high repetition rate (too high to be separated on these tapes, with about 120-140 per second, the highest easily read, as much as 5 seconds after the start of the series); the frequency and repetition rate drop gradually during a series, ending as low as 50 cps at a 1 second repetition rate. Lindsey (pers. comm.) compared this sort of call to a reversed recording of a ruffed grouse (*Bonasa umbellus*) drumming. Pulse duration varies from .005 to 1.5 seconds, the latter being the most isolated pulses, and increases with the repetition interval. The pulses are often a much as 40 db above background, and may be double or triple; that is, they may have two or three components, and in this case, of successively lower frequencies; pulses at high repetition rates appear single.

Individual pulses as well as components of multiple pulses are generally of distinct and descending frequency; the first of each multiple pulse is the highest. Harmonics are sometimes noted, but may be a feature of the recording and not of the actual sound. The average frequency drop within each pulse is as follows:

2000 cps at	10000 cps
1000	4000
100	300
50	100

Each succeeding pulse starts a little lower in frequency than the preceding ones.

Calls of both types, pulses and howls, are in Lindsey's 1934 record. He notes (1937, p. 143) that the calls heard under the ice, resembling the

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underwater ones on Ray and Lavallee's tapes, were made with the mouth shut, while others, including "bellowings, roars, and moans," were made with the mouth open.

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EXPLANATION OF THE PLATE

PLATE I

- FIG. 1. Underwater pulses produced by *Leptonychotes weddelli*. This 2-second excerpt occurred 10 seconds after the beginning of a pulse series which lasted about 25 seconds. A 200-cps analyzing filter bandwidth was used.